Proceedings

Galveston Bay Characterization Workshop February 21-23, 1991



Galveston Bay
National Estuary Program
GBNEP-6
February 1991
Reprinted March 1992

Proceedings

Galveston Bay Characterization Workshop February 21-23, 1991

This project has been funded in part by the United States Environmental Protection Agency under assistance agreement # CE-00655-01 to the Texas Water Commission. The contents of this document do not necessarily represent the views of the United States Environmental Protection Agency, the Texas Water Commission, nor the Galveston Bay National Estuary Program, nor does mention of trade names or commercial products constitute an endorsement or recommendation for use.



Policy Committee

The Honorable Rodney Ellis, Chair Texas Senate

Mr. John Hall Chair, Texas Water Commission

Ms. Linda Shead Executive Director Galveston Bay Foundation

Ms. Eileen Crowley Former President Greater Houston Partnership Chamber of Commerce Division Mr. Buck J. Wynne, III, Vice-Chair Regional Administrator, EPA Region 6

Mr. John Wilson Kelsey Vice-Chair, Texas Parks and Wildlife Commission

Mr. Charles W. Jenness Chair, Texas Water Development Board

The Honorable Jon Lindsay County Judge, Harris County

Local Governments Advisory Committee

The Honorable Ray Holbrook, Chair

Management Committee

Mr. Myron O. Knudson, Chair

Ms. Barbara Britton, Vice-Chair

Scientific/Technical Advisory Committee

Dr. Frank M. Fisher, Jr., Chair

Dr. Robert McFarlane, Vice-Chair

Citizen's Advisory Steering Committee

Ms. Sharron Stewart, Chair

Ms. Glenda Callaway, Vice-Chair

Galveston Bay Public Forum

Dr. Martin Arisco, Chair

Dr. Don Bass, Vice-Chair

Program Director

Dr. Frank S. Shipley

Table of Contents

	Table of Contentsvii
	Prefacexv
	Introductionxvii
OVERVIEW	Characterizing Galveston Bay: Connecting Science and Management at the Ecosystem Level. Frank S. Shipley, Galveston Bay National Estuary Program
RESOURCE AGENCY PROGRAMS	Texas Water Commission Water Quality Monitoring in the Galveston Bay System. <i>George Guillen, Texas</i> Water Commission
	Texas Parks and Wildlife Monitoring Program in the Galveston Bay Complex. Lawrence W. McEachron, Texas Parks and Wildlife Department
	History and Status of the Texas Molluscan Shellfish Regulatory Program. <i>Richard E. Thompson, Texas</i> Department of Health
	Fisheries Management Research in Galveston Bay. Edward Klima, Neal Baxter, James Nance, Geoffrey Matthews, Eduardo Martinez, Dennis Emiliani, and Margot Hightower, National Marine Fisheries Service
	Overview of Environmental Studies for the Houston-Galveston Navigation Channels, Texas Project. Thomas H. Rennie, Galveston District, U.S. Army Corps of
	Engineers
POINT AND NON-POINT SOURCE POLLUTION	Status and Trends of Water Quality, Sediment Quality, and Point Source Loadings in Galveston Bay. Neal E. Armstrong, Department of Civil Engineering, University of Texas at Austin; and George H. Ward, Center for Research in Water Resources, University of Texas at Austin
	Shoreline Surveys for Unpermitted Point Source Discharges. Roger R. Fay, R. J. Wilson, and Stephen T. Sweet, Geochemical and Environmental Research Group, Texas A&M University

	Characterization of Non-Point Sources and Loadings to Galveston Bay. Charles J. Newell, Groundwater Services, Inc.; and Hanadi S. Rifai and Philip B. Bedient, Department of Environmental Science and Engineering, Rice University	34
THE HOUSTON SHIP CHANNEL	Utilization of the Upper Houston Ship Channel by Fish and Macroinvertebrates with Respect to Water Quality Trends. Richard Seiler and George Guillen, Texas Water Commission; and Andre M. Landry, Jr., Texas A&M University at Galveston	39
	Water Quality and Ambient Toxicity Investigation of the Houston Ship Channel and Tidal San Jacinto River. Philip A. Crocker, Region 6, U.S. Environmental Protection Agency	46
	Industrial Point Source Discharges Into the Houston Ship Channel. Paula Thetford McCormick, Galveston Bay Foundation	49
	Survey of Floatable Debris in the Houston Ship Channel. Laura J. Radde, Region 6, U.S. Environmental Protection Agency; David Redford, U.S. Environmental Protection Agency, Washington, D.C.; and Wynne Trulli, Battelle Ocean Sciences	5 3
TOXICANTS IN WATER	Dissolved and Particulate Trace Metals in the Galveston Bay Water Column. G. Benoit, M. Hood, S. Oktay, C. Coleman, A. Cantu, and P. Santchi. Texas A&M University at Galveston	5 7
	Important Factors and Parameters in Monitoring Organic Pollution in Galveston Bay. C. S. Giam, Texas A&M University at Galveston	5 9
TOXICANTS IN AQUATIC ORGANISMS	Toxic Contamination of Aquatic Organisms in Galveston Bay. James M. Brooks, Terry L. Wade, Bobby J. Presley, José L. Sericano, Thomas J. McDonald, Thomas J. Jackson, Dan L. Wilkinson and Tamara F. Davis, Geochemical and Environmental Research Group, Texas A&M University	6 5
	Trace Organic Contamination in Galveston Bay: Results From the NOAA National Status and Trends Mussel Watch Program. Terry L. Wade, James M. Brooks José L. Sericano, Thomas J. McDonald, Bernardo Garcia- Romero, Roger R. Fay, and Dan L. Wilkinson, Geochemical and Environmental Research Group, Texas A&M University	6 8

	The Cycling of Nutrients in Galveston Bay: Factors Regulating Their Concentrations. P. H. Santschi and J. O. Samuell, Texas A&M University at Galveston
OLLUTANT RANSPORT	Natural Radionuclides as Tracers of the Self-Cleaning Capacity of Galveston Bay. M. Baskaran, C. Coleman, and P. H. Santschi, Texas A&M University at Galveston
	Gaillesion
	Tracer Gas Transfer Technique for Shallow Bays. Edward R. Holley, Center for Research in Water Resources, University of Texas at Austin
	Ontoersity of Texas at Musini
ABITAT FUDIES	Status and Trends of Galveston Bay Wetland Habitats. E. G. Wermund, Bureau of Economic Geology, University of Texas at Austin, and Lawrence R. Handley, National Wetlands Research Center, U. S. Fish and Wildlife Service
	Galveston Bay Habitats: Structure and Function in Relation to Fisheries Production. Roger Zimmerman, Peter Sheridan, Thomas Minello, and Thomas Czapla, National Marine Fisheries Service Galveston Laboratory
	Status and Trends Analysis of Oyster Reef Habitat in Galveston Bay. Eric N. Powell, Department of Oceanography, Texas A&M University; and Thomas M. Soniat, Department of Biology, University of New Orleans
	Status of Submerged Vegetation in the Galveston Bay System. Warren Pulich, Jr., Texas Parks and Wildlife Department; William A. White, Bureau of Economic Geology, University of Texas at Austin; and Marie Castiglione and Roger J. Zimmerman, National Marine Fisheries Service
COLOGICAL JRVEYS	An Environmental Inventory of the Armand Bayou Coastal Preserve. Robert W. McFarlane, Galveston Bay Foundation
	An Environmental Inventory of the Christmas Bay Coastal Preserve. Robert W. McFarlane, Galveston Bay Foundation
	rounaation137
	Advance Identification Study of Bolivar Flats. Norman Sears, Region 6, U.S. Environmental Protection Agency
	X

FAUNAL SURVEYS	Status and Trends of Selected Living Resources in the Galveston Bay System. Albert W. Green, Maury Osborn, Dean Keddy-Hector, and Junda Lin, Texas Parks and Wildlife Department 143
	Preliminary Characterization of Benthic Assemblages of Galveston Bay, Texas: Results from Sediment Profiling Imagery. Mark W. LaSalle, Mississippi State University Coastal Research and Extension Center; Robert J. Diaz, Virginia Institute of Marine Sciences; and Robert J. Bass, Galveston District, U.S. Army Corps of Engineers
	Preliminary Characterization of Benthic Assemblages of Galveston Bay, Texas: Results from Benthic Infaunal Sampling. Mark W. LaSalle, Mississippi State University Coastal Research and Extension Center; Robert J. Bass, Galveston District, U.S. Army Corps of Engineers; and Gary Ray, Waterways Experiment Station, U.S. Army Corps of Engineers
OTHER BIOLOGICAL STUDIES	Confirmed Presence of Neurotoxin-Producing Diatom Around Galveston, Texas. G. A. Fryxell, M.E. Reap, D. L. Roelke, L. A. Cifuentes, and D. L. Valencic, Department of Oceanography, Texas A&M University
	Sea Turtle Head Starting and Ecology Research. Clarles W. Caillouet, Jr., Sharon A. Manzella, Gregg R. Gitschlag, Maurice L. Renaud, and Edward F. Klima, National Marine Fisheries Service
	Responses of Postlarval Penaeid Shrimp to Galveston Bay Olfactants. Mark C. Benfield, Department of Wildlife and Fisheries Sciences, Texas A&M University; and David V. Aldrich, Texas A&M University at Galveston
PHYSICAL FEATURES	Long-Term Impact of Rising Sea Level and Major Hurricanes on Galveston Bay. John Anderson, Fernando Siringan, and Wendy Smyth, Department of Geology and Geophysics, Rice University; James Lawrence and Alta Cate, Department of Geosciences, University of Houston
	Historical Shoreline Changes in the Galveston Bay System. Jeffrey G. Paine and Robert A. Morton, Bureau of Economic Geology, University of Texas at Austin
INFLOW AND HYDROLOGY	Freshwater Inflows to Galveston Bay. Ruben S. Solis and David A. Brock, Texas Water Development Board171

	Next Generation Water Level Measurement System for Galveston Bay. Gary A. Jeffress and Richard R. Phelps, Conrad Blucher Institute for Surveying and Science, Corpus Christi State University
	Characteristics of Hydrographic Data in Galveston Bay. F. C. Schlemmer, II., Texas A&M University at Galveston
SALINITY	Salinity Characterization of Galveston Bay. S. Paul Orlando and C. John Klein, National Ocean Service, National Oceanic and Atmospheric Administration; Lawrence P. Rozas, Louisiana Universities Marine Consortium; and George H. Ward, Center for Research in Water Resources, University of Texas at Austin
	Paleoecological Evidence of Salinity Changes in Galveston Bay. Richard M. Yuill, ENTRIX, Inc
MODELING	Modeling Options for Galveston Bay. George H. Ward, Center for Research in Water Resources, University of Texas at Austin
	Hydrodynamic and Salinity Studies of the Galveston Bay System. Larry M. Hauck, Waterways Experiment Station, U. S. Army Corps of Engineers
	The COMPAS Screening Model for Galveston Bay. C. John Klein, National Ocean Service, National Oceanic and Atmospheric Administration; and George H. Ward, Center for Research in Water Resources, University of Texas at Austin
	Three-Dimensional Circulation and Salinity Transport Model of Galveston Bay. Keh-Han Wang, Department of Civil and Environmental Engineering, University of Houston 202
INFORMATION SYNTHESIS	Two Moves Equal One Fire: The Historical Data Base for Galveston Bay. George H. Ward, Center for Research in Water Resources, University of Texas at Austin; and Neal E. Armstrong, Department of Civil Engineering, University of Texas at Austin
	An Information Center for Galveston Bay. William A. Seitz and Natalie H. Wiest, Texas A&M University at Galveston

	COMPAS - NOAA's Coastal Ocean Management, Planning, and Assessment System. Charles Alexander and John Paul Tolson, National Ocean Service, National
	Oceanic and Atmospheric Administration
APPENDIX	List of Primary Authors217

Preface

The Galveston Bay National Estuary Program

By all measures, Galveston Bay ranks high among the estuaries recognized by Congress as Nationally Significant. The Bay's seafood productivity; its role as a major recreational resource; its multi-billion dollar influence on the economy (as third largest port in the nation, sixth largest in the world); its role as a repository for half the permitted waste water discharges in Texas; its declining wetlands; the contamination of its sediments, water, and marine life: all these have prompted a concern that the human pressures on the estuary are overpowering its natural resiliency.

The Galveston Bay National Estuary Program (GBNEP) was created in response to this concern for Galveston Bay. The emphasis of the GBNEP is to solve the Bay's problems by improving our governance of the Bay. In the past, the Bay has not been managed as a single ecosystem, resulting in diverse activities and little coordination among the numerous agencies involved. Without a coordinated effort among user groups, regulators, and the public, the value of Galveston Bay as a Texas and American resource is at risk.

The GBNEP was conceived as a cooperative effort by the State of Texas and the U.S. Environmental Protection Agency. In organization, the GBNEP consists of a Management Conference of about one hundred individuals representing all segments of the Galveston Bay Community. The Management Conference is organized in six committees, under the authority of a Policy Committee, and is coordinated by a Director and Program Office staff under the auspices of the Texas Water Commission.

As a National Estuary Program, the GBNEP is authorized by the Water Quality Act of 1987 to draft a Comprehensive Conservation and Management Plan (CCMP) to address the recognized threats from pollution, development, and overuse of Galveston Bay. The drafting of a CCMP is a staged process preceded by identification and ranking of estuarine problems and information-gathering and scientific work to better define these problems. These proceedings are part of the scientific efforts to establish an objective information basis for effective estuary management.

Introduction

The fifty-six short papers composing this proceedings represent the concerted work of numerous scientists with a knowledge of, and concern for, Galveston Bay. These papers are the result of an invitation to the scientific community for contributions centered on estuarine problems already identified and agreed upon by consensus as a *Galveston Bay Priority Problems List* (see page 4). Reports on work in progress were encouraged, as well as completed projects.

These contributions have helped successfully accomplish four broad goals: first, to identify scientific work on Galveston Bay being conducted by institutions other than the GBNEP; second, to promote peer interaction among the principle investigators involved in this research; third, to improve our understanding of estuarine problems in need of management solutions; and finally, to encourage project coordination in an ecosystem context.

For the GBNEP, this workshop and proceedings constitute a step midway in the process toward drafting of the CCMP. Previous Scientific efforts have identified a critical need for comprehensive studies of Galveston Bay (Galveston Bay: Issues, Resources, Status, and Management, U. S. Department of Commerce, 1989). Future work will result in publication of a Galveston Bay Environmental Characterization Report in 1993 that will help establish a comprehensive factual basis for the CCMP.

In compiling these contributions and listening to the related workshop discussions, we have recognized several themes that will affect our future work. One is a realization of the abundance of good information on Galveston Bay (more than anyone thought existed). Another is the fragmented nature of this information and the lack of connectedness of the ongoing work, particularly for resource agencies charged with managing the estuary. Finally, a significant loss of historical data suggests a need for an ongoing, organized system to maintain Galveston Bay data and information.

As scientific efforts are consolidated during the remainder of the Bay characterization process, our greatest challenge will therefore be to insure the permanence of research findings, and make them systematically useful to resource managers. Thankfully, this challenge has attracted most of the best Texas coastal researchers, who have shown a continuing commitment to conservation based on the best science available.

On behalf of Galveston Bay National Estuary Program we extent our gratitude to each author involved in improving our understanding of this significant Texas resource. We particularly extend our thanks to the individuals who "volunteered" their services as Session Chairs in response to our hopeful suggestions; and to Carol Ward who tirelessly presided over the multitude of arrangements for this Workshop.

- Eds.